CURRICULUM VITAE

ANDRÁS SZILÁGYI

M.Sc. in physics, Ph.D. in biological physics, presently employed as research associate professor at Institute of Evolution, Centre for Ecological Research, leader of the Darwinian Neurodynamics Research Group.

CONTACT INFORMATION

Institute addresses: Institute of Evolution, Centre for Ecological Research
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PERSONAL INFORMATION

Name: András György Szilágyi

Nationality: Hungarian

Place and date of birth: Budapest, Hungary, 8th December 1979

Marital status: married, two children

Private address: Mátyás király út 41/A., Budapest H1121, Hungary

Private phone: **(**+36)30-239-8415

EDUCATION

2004–2007: Ph.D. in Biological physics at Eötvös Loránd University (Budapest), Physics Ph.D. School (summa cum laude).

1998–2003: M.Sc. in Physics at Budapest University of Technology and Economics (excellent).

1994–1998: Baár–Madas Calvinist Secondary School, specialized in mathematics

RESEARCH EXPERIENCES

2017–present: **Research associate professor** at the Center for Ecological Research, Institute of Evolution, leader of the Darwinian Neurodynamics Research Group

2012–present: **Research associate professor** at the Hungarian Academy of Science (HAS) Theoretical Biology and Evolutionary Ecology Research Group at Eötvös Loránd University (part time from 2017).

2012–2015: **Member of the Parmenides Team** in the FP7 ERC advanced grant project EVOEVO (*Evolution of Evolvable Systems*; PI: Eörs Szathmáry; 2012-2017; project #294332; total funding 2 616 700 €).

2012–2015: **Postdoctoral research fellow** at the Parmenides Centre for the Conceptual Foundation of Science, Pullach, Germany.

2009–2011: **Research assistant** at the Hungarian Academy of Science (HAS) Theoretical Biology and Evolutionary Ecology Research Group at Eötvös Loránd University.

2010–2011: Worked in the FP7 EU project e-Flux (*Evolutionary microfluidics*; PI: Eörs Szathmáry; 2009–2011; project #225167; total funding: 2 300 000 €).

2007–2010: **Research assistant** (scientific coworker) at Department of Organic Chemistry, Faculty of Pharmacy at Semmelweis Medical University.

2004–2007: Ph.D. thesis work at Eötvös Loránd University, Department of Biological Physics: "*Extension of a niche concept to spatially heterogeneous and time fluctuating environment*". Supervisor: Dr Géza Meszéna.

2003–2004: researcher as a university student at Hungarian Meteorological Service.

AWARDS

2003: 1st prize at scientific competition of university students (TDK) mathematics—theoretical physics section

2003: TDK Special Award of the Pro Progressio Foundation

LANGUAGES AND LEVELS

Hungarian: mother tongue.

English: intermediate level (C) state language exam.

Latin: intermediate level (C) state language exam.

PROFESSIONAL ACTIVITIES

My scientific interest has a focus on theoretical evolutionary biology and theoretical ecology. My researches cover different topics in this field: origin of life, major evolutionary transitions, diversity maintaining mechanisms and stability of ecosystems, evolutionary dynamics at various levels, from chemistry to biology, and modeling neural networks

In the past years me (in collaboration with my colleagues) achieved the following results:

- formalized a mathematically rigorous concept of ecological “niche” for structured population;
- using the previously formalized niche concept, we analyzed the diversity maintaining ability of fluctuating environment in ecosystems;
- by computer simulation in a simplified model system we showed that efficient enzymes potentially emerged after the invention of chromosomes;
- *in-silico* analyzed the effect of taking the secondary structure of RNAs into account on the amount of sustainable information in prebiotics (the so called phenotypic error threshold);
- analyzed the stability and evolvability of an extended model of metabolically coupled surface bound replicator system as an important question in a possible scenario of the origin of life;
- presented an evolutionary scenario (in line with experimental data) of the emergence of mutualism in ant-plant symbiosis;
- by computer simulations we have proved the possibility of the evolutionary emergence of a primordial transcription-like system in model protocells;
- in a neuronal toy model we have demonstrated the possibility of real Darwinian dynamics on neural networks, as a proof-of-principle.

Presently I am working on the following topics:

- unfolding the analogies between the dynamics of artificial associative neural networks and genetic regulatory networks

- further development of the surface bound Metabolically Coupled Replicator System (MCRS) towards chemically and biologically realistic directions
- analysis and individual based modeling of parabolic replication with a special emphasis on its role in the origin of life
- analysis of the evolutionary origins of ageing

TEACHING EXPERIENCE

Mathematical modeling in biology I (Eötvös University)
Mathematical modeling in biology II (Eötvös University)
Frontlines in research of evolution (Eötvös University, with others)
Major transitions in evolution (Eötvös University, with others)
Modern physics practice and laboratory for physicists (Eötvös University, formerly)
Introductory modern physics for info-bionics students (Pázmány Péter Catholic University, formerly)
Molecular modeling for senior pharmaceutical students (Semmelweis Medical University, formerly)
Preparing students for competitions in physics at secondary school level (Baár–Madas Calvinist Secondary School)

SCHOLARSHIPS AND GRANTS

2021. September – 2024. August: Bolyai János Research Fellowship of the Hungarian Academy of Sciences (3 years, total funding: 5 MHUF (~14 000 €)).
2019. September – 2020. August: ÚNKP-19-4 New National Excellence Program of the Ministry of Human Capacities (1 year, total funding: 2 MHUF (~6 000 €)).
2019. July – 2024. June: Senior research fellow in the NKFIH Frontline project #129848: "*Evolution and Learning*" (4 years, total funding: 282 MHUF (~850 000 €)).
2018. September – 2020. August: Bolyai János Research Fellowship of the Hungarian Academy of Sciences (2 years, total funding: 3 MHUF (~10 000 €)).
2018. September – 2019. August: ÚNKP-18-4 New National Excellence Program of the Ministry of Human Capacities (1 year, total funding: 2 MHUF (~6 500 €)).
2017. October – 2021. September: Senior research fellow in the OTKA project #124438: "*Cooperative and competitive evolutionary dynamics at different levels of organization*" (4 years, total funding: 32.3 MHUF (~108 000 €)).
2016. October – 2021. September: Senior research fellow in the OTKA project #119347: "*Dynamical models in the origin of life*" (4 years, total funding: 38.8 MHUF (~130 000 €)).
2016. September – 2017. March: Postdoctoral research fellow**,** II. New Central European Scholarship, Institute of Advanced Studies, Kőszeg, Hungary
2012 September – 2015 August: Postdoctoral scholarship at the Parmenides Foundation, Munich (Germany): FP7 ERC Advanced Grant project EVEEVO ("*Evolution of Evolvable Systems"*; PI: Eörs Szathmáry; 2012-2017; #294332)
2015. September – 2016. December: Postdoctoral research assistant in the OTKA project #100806: "*Simulation studies in prebiotic evolution: Infrabiological differentiation in the Metabolic Replicator System*" (4 years, total funding: 25.1 MHUF (~81 000 €)).
2009. March – 2011. December: Postdoctoral research assistant in the OTKA project #73047: "*Computational study of evolution in early life and extant model organisms*" (4 years, total funding: 56 MHUF (~181 000 €)).

2005. January – 2007. August: Research assistant in the OTKA project #49689: "*Adaptive ecology in variable environment*" (4 years, total funding: 7.8 MHUF (~25 000 €)).

2004. January – 2004. December: Research assistant in the OTKA project #47035: "*Problems of inverse scattering theory*" (5 years, total funding: 4.2 MHUF (~13 600 €)).

PUBLICATIONS:

number of publications in peer-reviewed journals: 32 (cumulative IF: 208.3)
popular science articles (in Hungarian): 8
conference proceedings: 3
book co-edited (in Hungarian): 1
lecture notes in mathematical biology (in Hungarian): 2
introductory modern physics lecture notes for biologists (in Hungarian): 1
Google Scholar: Szilágyi András@Google Scholar
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BOOK EDITING

Koch Sándor: Pillanat—ember—végtelenség, a 80 esztendős Koch Sándor köszöntése (in Hungarian) (Eds.: S. Juhász-Nagy, **A. Szilágyi**)

PATENT

Szathmáry, E., **Szilágyi, A**., Zachar, I., Fedor, A., de Vladar, H.: *Electronic devices, artificial evolutionary neural networks, methods and computer programs for implementing Evolutionary search and optimisation* (PCT/EP2016/054694, WO/2017/148536)

Budapest, 1 February 2022

András Szilágyi